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(58) Field of search
F2V

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(54) Improvements in valves

(57) A valve has a body (1) in which a ball valve member (7) is rotatable to control fluid flow between an inlet (3) and an outlet (5). The sealing means for the ball (7) comprises two polytetrafluoroethylene (PTFE) sealing rings (22, 23) which are retained in sealing engagement with the ball (7) by a resilient member such as a spring washer (26). The spring washer (26) may act on one of the rings directly, or through a cage member (24).

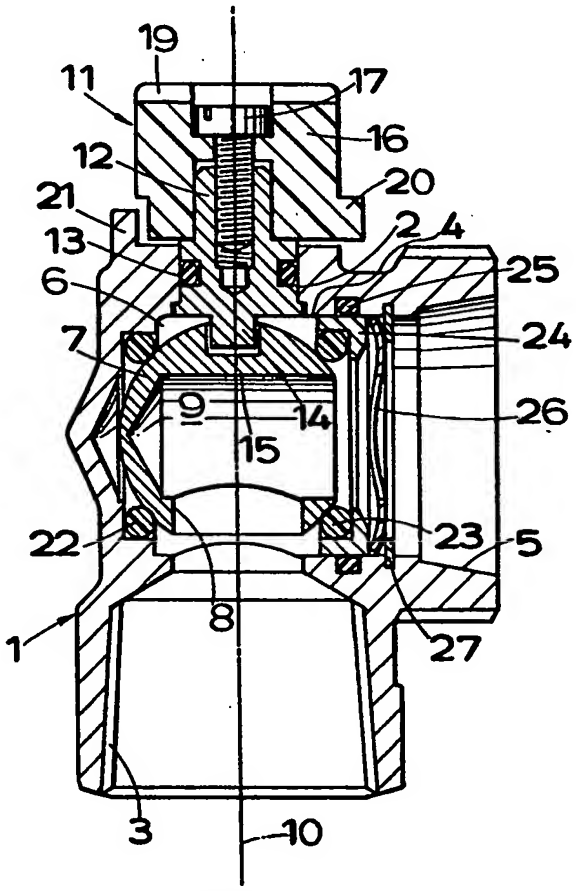

FIG.1.

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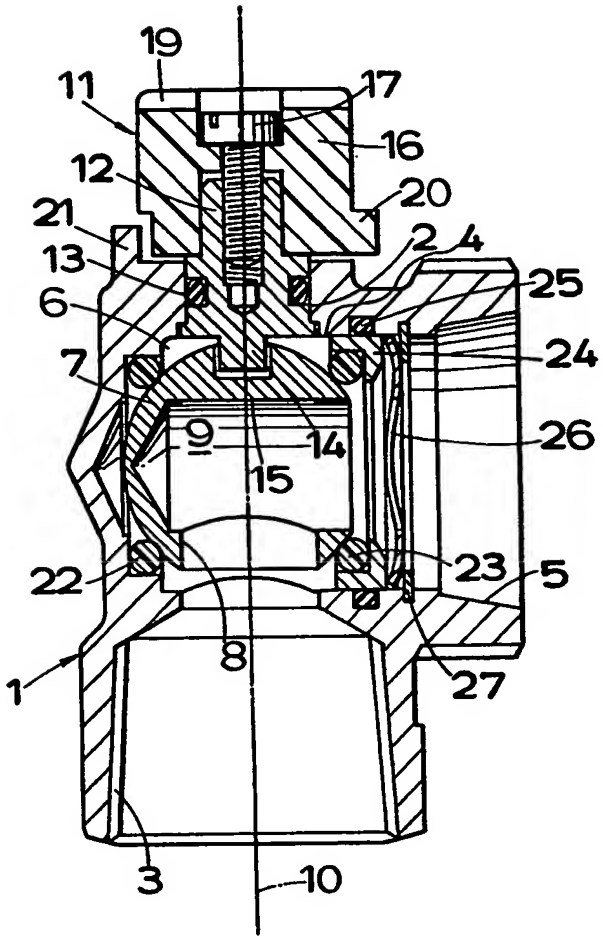
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FIG.1.

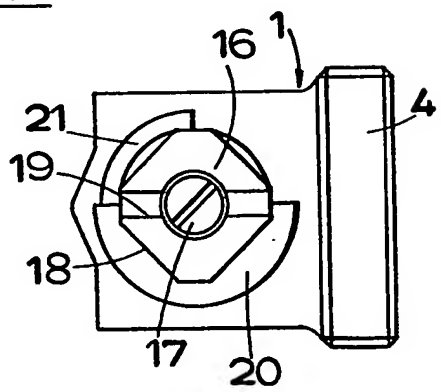
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FIG.2.

SPECIFICATION

Improvements in valves

This invention relates to valves of the kind comprising a valve body in which a valve member is rotatable to control fluid flow between an inlet and an outlet.

In valves of the kind set forth, such as ball valves, where the valve member comprises a ball, fluid flow between the inlet and the outlet is provided through passages in the ball, the ball being rotatable between a position in which fluid flow between the inlet and outlet is permitted and a position in which such fluid flow is prevented. Such ball valves are commonly used as water or gas control valves, serving as an on/off control for the supply to a domestic appliance. It is important to ensure that the ball is properly sealed to prevent leakage, especially where the valve is used as a gas control valve. Normally the ball is sealed by one or more rubber O-rings, which may also seal against the valve body. The rubber O-rings provide a good seal, as they are resilient, but if the valve is not used regularly, they tend to stick to the ball, and are damaged when the valve is operated next. Further, with some seals it may be necessary to provide an adjustable retainer, such as a screw-threaded sleeve, for the ball and seal assembly. Such a sleeve may be expensive to provide, and requires manual adjustment either when the valve is assembled, or when it is installed.

According to our invention, in a valve of the kind set forth polytetrafluoroethylene (PTFE) sealing means is provided to seal the valve member, and resilient means is incorporated to retain the sealing means in sealing engagement with the valve member.

The disadvantage of using rubber seals is therefore overcome by the use of PTFE seals, which will not stick. The resilient means provides the necessary resilience that these seals lack.

Conveniently the sealing means includes one PTFE sealing ring, which is in sealing engagement with the valve body, or is retained by a cage member, which itself has a sealing engagement with the body. The sealing means may also include a second PTFE sealing ring, which may seal against the body, or may simply act as a support for the valve member.

Preferably the resilient means comprises a single resilient member, which may act directly one one of the rings, or on the cage member. Th resilient member preferably compris s a spring washer, such as a crinkled washer.

Conveniently, the valv member comprises a ball.

In a preferred mbodiment the valve member comprises a ball provided with two PTFE O-rings, one ring also sealing against the valv body, and the other being retained by a cage member, with a further seal provided between the cage m mber and the valve body, and a spring washer acts on the cage member, and is retained in th body by a locking ring. This provides a particularly compact construction which is easy to assemble, and does not require any manual adjustment, either on assembly, or on installation.

The PTFE sealing rings may be composed, wholly of PTFE, or a mixture of PTFE and glass fibre.

One embodiment of our invention is illustrated by way of example only, in the accompanying drawings, in which:

Figure 1 is a cross-section through a ball valve; and

Figure 2 is a top view of the valve of Fig. 1.

The ball valve shown in the drawings is designed for use as a gas control valve, in particular as a service control valve, that is, an on/off valve for controlling the supply to a domestic appliance.

The valve, as seen in Fig. 1, has a T-shaped metal body 1, provided with a stepped through bore 2, including an inlet 3, and a stepped blind bore 4 at right angles to the bore 2, which includes an outlet 5. The intersection of the two bores 2, 4 forms a valve chamber 6, in which is located a ball valve member 7, which is made of brass. The ball 7 has connecting inlet and outlet passages 8, 9, which are at right-angles. In the position shown in Fig. 1 the inlet and outlet passages 8, 9 of the ball 7 are in registry with the inlet 3 and outlet 5 respectively, so that gas can flow from the inlet to the outlet. Rotation of the ball 7 through a right angle about an axis 10 brings the outlet passage 9 out of registry with the outlet 5, closes off communication between the inlet 3 and outlet 5.

The ball 7 is rotated by a key assembly 11. This comprises a metal spindle 12 of stepped outline which is located in the end of the bore 2 remote from the inlet 3, and has a seal 13 sealing against the bore 2. The spindle 12 has at its inner end a projection 14 which engages in a slot 15 formed in the ball 7. A key member 16 of glass-filled nylon is attached to the spindle 12 by a screw 17. The key member 16 has a square head 18, and a slot 19 to enable it to be rotated by using appropriate tools. At its inner end the key member 16 has a flange 20 which extends round half its circumference. This flange 29 co-operates with a projecting flange 21 on the body 1 to ensure that th ball 7 cannot be rotated more than 90°.

Th ball 7 and the valv chamber 6 ar sealed to prev nt leakag of gas. Th ball 7 is pr vided with two polytetrafluoroethyl ne (PTFE) sealing rings 22, 23. Th ring 22, which is located at the inn r end of the bore 4, also seals against the valve body 1, while the ring 23 is h ld by an annular brass cage

24, which is located in the bore 4. A seal 25 in the bore 4 seals between the cage 24 and the bore 4. A resilient means in the form of a crinkled washer 26 acts on the cage 24, and is held in position in the bore 4 by a locking ring 27. The washer 26 acts to maintain the sealing rings 22, 23 in engagement with the ball 7, and provides the sealing ring and ball assembly with the necessary resilience to accommodate manufacturing tolerances and such like.

The use of the PTFE sealing rings 22, 23 overcomes the problem, found with rubber seals, of the rings sticking to the ball 7. The washer 26 provides the resilience that the PTFE rings lack.

The resiliently-loaded PTFE seals 22, 23 provide more resistance to rotation of the ball 7 than rubber seals do, so that more torque is required to operate the valve. This is also an advantage, as it makes it more difficult to operate the valve manually, which helps to guard against tampering. The resistance can be altered by changing the loading on the seals, which is dependent on the resilient means and the material of the seals 22, 23. When the valve is assembled, the action of the resilient means on the seals 22, 23 causes them to deform—a process known as "cold flow"—until an equilibrium position is reached. Altering the resilient means will therefore alter the equilibrium position, and the loading on the seals 22, 23. Alternatively, if the seals, instead of being wholly of PTFE, include a small percentage of glass fibre, they are stiffer and do not deform so much, so in their equilibrium position the resilient means exerts a greater load on the seals. A further method of altering the torque required to operate the valve is to arrange the key member 16 in engagement with the body 1, to provide a resistance to rotation of the key member 16.

The arrangement of the rings and washer shown provides a particularly compact construction, and is easy to assembly. The use of the resilient washer 26 also means that the sealing ring the ball assembly requires no manual adjustment, either on assembly, or when the valve is installed.

In a modification (not shown) the construction may be further simplified by omitting the cage 24 and seal 25, and providing a ring 23 of suitable shape to seal both against the ball 7 and the bore 4. Different forms of resilient means may also be used.

CLAIMS

1. A valv of the kind s t forth, in which polyt trafluoroethyl ne (PTFE) sealing m ans is provided to seal the valve member, and a resili nt means is incorporated to retain the sealing means in sealing engagement with the valve memb r.

2. A valve as claim d in claim 1, in which th sealing means includ s a PTFE sealing ring which is also in sealing ngagement with th valve body.

3. A valve as claimed in claim 1, in which the sealing means includes a PTFE sealing ring retained by a cage member which has a sealing engagement with the valve body.

4. A valve as claimed in claim 2 or claim 3, in which the sealing means also includes a second PTFE sealing ring acting to support the valve member.

5. A valve as claimed in claim 4, in which the second PTFE ring also seals against the body.

6. A valve as claimed in any preceding claim, in which the resilient means comprises a single resilient member.

7. A valve as claimed in claim 6 and any of claims 2, 4 or 5, in which the resilient member acts directly on one of the PTFE sealing rings.

8. A valve as claimed in claim 3 and claim 6, in which the resilient member acts on the cage member.

9. A valve as claimed in any of claims 6 to 8, in which the resilient member comprises a spring washer.

10. A valve as claimed in any preceding claim, in which the valve member comprises a ball.

11. A valve of the kind set forth, in which the valve member comprises a ball, and a sealing means for the ball comprises two PTFE sealing rings, one ring also sealing against the valve body and the other ring being retained by a cage member, with a further seal provided between the cage member and the valve body, and a resilient means in the form of a spring washer acts on the cage member to retain the sealing rings in sealing engagement with the ball, the washer being retained in the body by a locking ring.

12. A valve as claimed in any preceding claim, in which the PTFE sealing means is composed wholly of PTFE.

13. A valve as claimed in any of claims 1 to 11, in which the PTFE sealing means is composed of a mixture of PTFE and glass fibre.

14. A valve of the kind set forth substantially as described herein with reference to and as illustrated in the accompanying drawings.

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